# Researchers develop 'smart' paper and antennaless RFID tags

May 2 2013

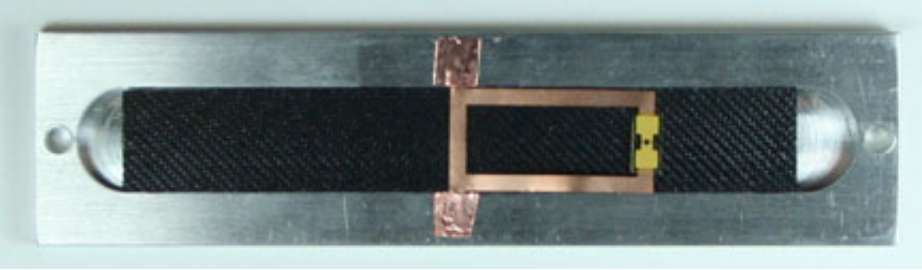

Researchers at North Dakota State University, Fargo, have developed a method to embed ultra-thin, ultra-small RFID chips on paper or other flexible substrates, which could help combat document counterfeiting. The patent-pending process, called Laser Enabled Advanced Packaging (LEAP), uses a laser beam's energy to precisely transfer and assemble chips with dimensions well below those possible using conventional methods. The image at the bottom is backlit to show the embedded RFID antenna and chip. Credit: North Dakota State University, Center for Nanoscale Science and Engineering

Research teams at North Dakota State University, Fargo, have developed a method to embed radio frequency identification (RFID) tags in paper, which could help combat document counterfeiting, and have developed antennaless RFID tags for use on metal. Both teams of researchers are presenting their technology advances at conferences from April 30 to May 2 in Orlando, Fla. Dr. Val Marinov will present research at RFID Journal LIVE! and Cherish Bauer-Reich and Layne Berge are presenting at the Institute of Electrical and Electronics Engineers (IEEE) International Conference on RFID, highlighting the NDSU technology breakthroughs.

Antennaless RFID tags and "smart" paper developed at North Dakota State University are featured at exhibit booth #544 at RFID Journal LIVE!

## "Smart" paper

Dr. Val Marinov's team has developed a method to embed ultra-thin, ultra-small RFID chips on paper or other flexible substrates, which could lead to ways to reduce counterfeiting of a wide variety of items such as pharmaceuticals, currency, legal papers, bearer bonds and other security documents. The patent-pending process, known as Laser Enabled Advanced Packaging, uses a laser beam's energy to precisely transfer and assemble chips with dimensions well below those possible using conventional methods.



A patent-pending technology developed by a research team at the Center for Nanoscale Science and Engineering (CNSE) at North Dakota State University, Fargo, could help companies track products as varied as barrels of oil to metal cargo containers. The on-metal, antennaless RFID tag developed at NDSU CNSE is approximately 2.5mm thick and uses the metal container as the antenna to transmit information. This prototype tag is inset in an aluminum background, covered in 3D-printed ABS plastic. The integrated circuit is connected to the aluminum via a copper tuning loop. Credit: North Dakota State University, Center for Nanoscale Science and Engineering

The embedding method involves chips thinner than most commercial RFID chips on the market today. "We use our LEAP technology to embed ultra-thin, ultra-small semiconductor chips, including 350 µm/side, 20 µm thick semiconductor dice, in paper substrates with a thickness of